

## ASTRANTHIUM AND RELATED GENERA

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Monographic studies of *Aphanostephus* and *Achaetogeron* have made it necessary to investigate some of the related genera, particularly as to the value of certain morphological characters which are used in generic differentiation. The genera are quite similar in habit but the pappus, which furnishes important diagnostic characters, varies greatly within the group and is on the whole inconspicuous. For this reason it is necessary to make microscopic studies of the minute achenial and pappus characters upon which the differentiation of genera is primarily dependent. In this connection it was desirable to study *Astranthium* and *Keerlia* in detail; and it seems advisable to put on record the results which have been obtained relative to these genera.

*Astranthium*, a genus of the Compositae belonging to the tribe Astereae, was described by Nuttall in 1841.<sup>1</sup> It contained but one species, *A. integrifolium*, based on *Bellis integrifolia* Michaux.<sup>2</sup> The 'Flora of North America,' published by Torrey and Gray in 1842, relegated *Astranthium* to synonymy. Since that time American and Mexican species have been merged with the genus *Bellis*<sup>3</sup> which is indigenous to the Old World and especially to Europe. Three South American species have been described by Vellozo<sup>4</sup> as occurring in Brazil. Two of these, *Bellis campestris* Vell. and *B. pedunculata* Vell., may well be members of the genus *Spilanthes*. The relationship of the third, *Bellis scandens* Vell., is unknown to me.

*Bellis perennis* L. is an attractive plant, and for this reason it has been cultivated in the north Atlantic states where it has become naturalized. The American species which have been referred hitherto to the genus *Bellis* are so strikingly different that it seems strange the two generic elements should have been regarded

<sup>1</sup> Nutt. Trans. Am. Phil. Soc. N. S. 7: 312. 1841.

<sup>2</sup> Michx. Fl. Bor. Am. 2: 131. 1803.

<sup>3</sup> Torr. & Gray, Fl. N. Am. 2: 189. 1842.

<sup>4</sup> Vell. Fl. Flum. 8: pl. 124-126. 1827; text, pp. 338, 359, ed. 1881.

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for such a long time as congeneric. The range of *Bellis* in North America is far to the north of *Astranthium integrifolium* (Michx.) Nutt., whose northernmost limit of distribution is in Kentucky. *Bellis perennis* L., on the other hand, is reported from the islands of St. Pierre and Miquelon, off the coast of Newfoundland, south to Pennsylvania, and in northwestern America north to Vancouver Island. Because of the difference in morphological characters it seems advisable to recognize *Astranthium* as a distinct genus.

Six Mexican species have been described under *Bellis*, all of which are here transferred to *Astranthium*, except *B. Garciae* Blake. The first Mexican species was described by Gray in 1852 as *Bellis mexicana*,<sup>5</sup> and in 1881 he transferred *Brachycome xanthocomoides*<sup>6</sup> to that genus. Since then four additional species have been published, namely, *B. purpurascens* Rob.,<sup>7</sup> *B. orthopoda* Rob. & Fern.,<sup>8</sup> *B. mima*, and *B. Garciae* of Blake.<sup>9</sup> Another species is added to this group by the transfer of *Keerlia mexicana* Gray ex Wats.<sup>10</sup> to *Astranthium* where it receives the new name *Astranthium xylopodum* Larsen, because of the earlier *Bellis mexicana* Gray.

Only one species, *Astranthium integrifolium*, occurs in the United States. In 1836 Rafinesque described three species, *Bellis parvifolia*, *Bellis nutans*, and *Bellis ciliata*.<sup>11</sup> The first two are considered synonymous with *Astranthium integrifolium* and the last is regarded as a variety of that species.

The genus *Keerlia*, which is closely related to *Astranthium*, was first described by De Candolle<sup>12</sup> in 1836. It contained three species, *K. linearifolia*, *K. ramosa*, and *K. skirrhobasis*. All three species have been transferred to other genera since that time. *Keerlia linearifolia*, which would ordinarily be interpreted as the generic type, was based on two distinct plants, one collected by Alaman and the other by Schiede. The former was referred to the genus *Xanthocephalum* by Dr. J. M. Greenman who pub-

<sup>5</sup> Gray, Smiths. Contr. [Pl. Wright. pt. 1] 3: 93. 1852.

<sup>6</sup> Gray in Hemsl. Biol. Cent.-Am. Bot. 2: 118. 1881.

<sup>7</sup> Rob. Proc. Am. Acad. 27: 172. 1892.

<sup>8</sup> Rob. & Fern. Proc. Am. Acad. 30: 117. 1894.

<sup>9</sup> Blake, Contr. U. S. Nat. Herb. 22: 593. 1924.

<sup>10</sup> Gray ex Wats. Proc. Am. Acad. 22: 422. 1887.

<sup>11</sup> Raf. New Fl. Am. 2: 23. 1836.

<sup>12</sup> D. C. Prodr. 5: 309. 1836.



lished the new combination *Xanthocephalum linearifolium* (DC). Greenm.<sup>13</sup> The latter, namely, the Schiede plant, on which *Brachycome xanthocomoides* was based and cited in synonymy by De Candolle, was transferred by Hemsley to the genus *Bellis* and published as *Bellis xanthocomoides* Gray ex Hemsley.<sup>14</sup> *Keerlia ramosa*<sup>15</sup> and *Keerlia skirrhobasis*<sup>16</sup> have both been transferred by Gray to the genus *Aphanostephus*.

Since the original publication of the genus by De Candolle the following species have been described: *Keerlia bellidifolia* Gray & Engelm.,<sup>17</sup> *Keerlia effusa* Gray,<sup>18</sup> and *Keerlia mexicana* Gray ex Wats.<sup>19</sup> Of these three species only the first two are retained in *Keerlia*, the third is transferred to *Astranthium*. Although all of the species originally described by De Candolle in *Keerlia* have been excluded from that genus, nevertheless it seems advisable to use *Keerlia* as the generic name for the residue, namely, for those species which have been described subsequently and still remain in that genus. The historical name is thus retained; and the genus is delimited in accordance with Gray's treatment in the 'Synoptical Flora of North America'.<sup>20</sup> Moreover, the name *Bourdonia*, proposed by Greene,<sup>21</sup> falls to synonymy.

#### GENERAL MORPHOLOGY

The American genus *Astranthium* is morphologically distinct from *Bellis* of the Old World with which it was merged in 1842. In habit the genera are quite different. *Bellis* produces long naked monocephalous peduncles from rosulate clusters of basal leaves, whereas the stems of *Astranthium* are usually branched and seldom entirely naked.

The involucre of *Astranthium* is composed of two or three series of bracts which are usually membranaceous margined.

<sup>13</sup> Greenm. Field Mus. Nat. Hist. Publ. Bot. Ser. 2: 345. 1912.

<sup>14</sup> Gray in Hemsl. Biol. Cent.-Am. Bot. 2: 118. 1881.

<sup>15</sup> Gray, Proc. Am. Acad. 16: 81. 1881.

<sup>16</sup> Gray, Smiths. Contr. [Pl. Wright. pt. 1] 3: 93. 1852.

<sup>17</sup> Gray & Engelm. Proc. Am. Acad. 1: 47. 1848.

<sup>18</sup> Gray, Bost. Jour. Nat. Hist. [Pl. Lindh. pt. 2] 6: 222. 1850.

<sup>19</sup> Gray, Proc. Am. Acad. 22: 422. 1887.

<sup>20</sup> Gray, Syn. Fl. N. Am. 1<sup>2</sup>: 164. ed. 2, 1886 and 1888.

<sup>21</sup> Greene, Erythea 1: 207. 1893.



The involucre bracts of *Bellis* differ in that they are subuniseriate, more or less united at the base, and distinctly foliaceous throughout. On the whole they are broader than those of *Astranthium* and less acute.

A marked contrast between the two genera is to be found in the receptacle. In *Astranthium* it is a low, convex, cushion-like structure with alveolate surface of a light creamy or whitish color. The receptacle of *Bellis* is distinctly conical. It has a smooth, almost shiny, dark greenish-brown surface which is broken only by the white spots indicating points of achenial attachment, and by depressions which are due to shriveling of the subepidermal tissue (pl. 2, figs. 1 and 7).

The corollas of the disk- and ray-flowers are very similar in these genera. The ray-flowers of *Astranthium* may be said to be proportionately longer than those of *Bellis*. The stamens in both cases are typically asteroid (pl. 2, figs. 2, 3, 4, 8, 9, 10).

The achenes of the genera are similar in outline and size. *Bellis* has achenes with distinct margins, while those of *Astranthium* are without distinct margins and are usually more or less pubescent with glochidiate-tipped hairs.

The pistils are similar in size but differ in the characters of their style-branches. *Astranthium* has long, slender, acute style-branches in contrast to those of *Bellis*, which are only about one-half as long as broad, thick, and obtuse (pl. 2, figs. 5, 6, 11, 12).

The pappus is entirely lacking in *Bellis* and this is also the most usual condition in *Astranthium*. There are, however, certain exceptions. *Astranthium xanthocomoides* has a slight indication of a ring-like crown. The ring-like crown is more noticeable in *A. orthopodum* and becomes conspicuous in *A. mexicanum* var. *chihuahuense* where it is somewhat fluted. This vestigial pappus when present forms an unbroken ring-like crown which is entirely without lacerate margins commonly found in related genera.

#### GEOGRAPHICAL DISTRIBUTION

The only representative of the genus *Astranthium* occurring in the United States is *Astranthium integrifolium* with its two varieties *ciliatum* and *rosulatum*. The species extends from



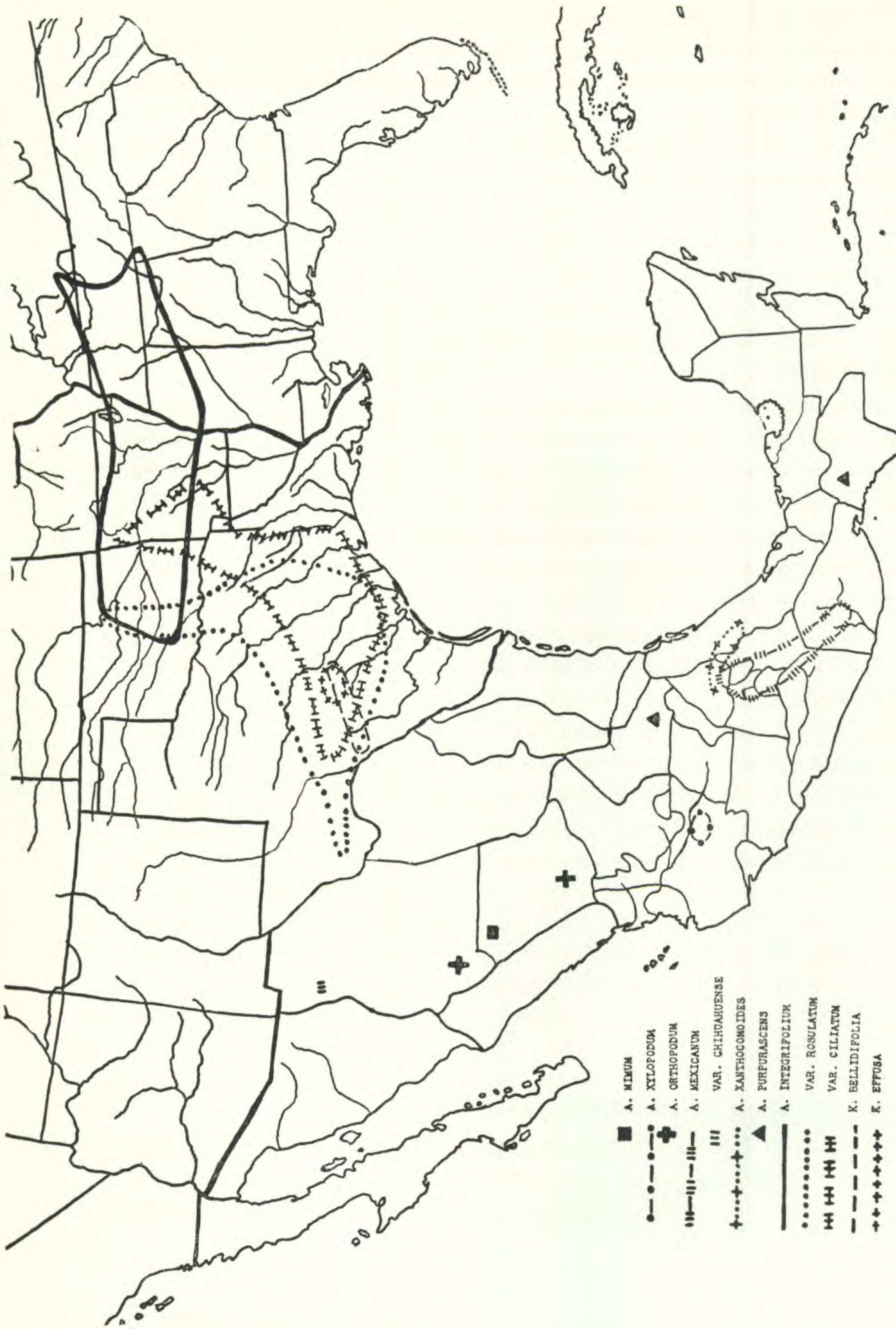


Fig. 1. Geographical distribution of *Astranthium* and *Keeria*.

After the cut of the map had been made material was found which extends the range of two of the species. A specimen of *Astranthium integrifolium* from Chautauqua Co., Kansas, extends the range of the species northwestward into that state. *Keeria bellidifolia* has been collected in Nueces Co., in southeastern Texas.



Georgia and Kentucky to western Oklahoma and Kansas. The varieties occur in Oklahoma, Arkansas, and Texas.

Mexican representatives of *Astranthium* are scattered throughout Mexico from Chihuahua to Chiapas. There is very little material in American herbaria representing Mexican species. *Astranthium mimum* is known only from the locality in which it was collected originally. *Astranthium purpurascens* was found by C. G. Pringle in San Luis Potosi, but the same species was also collected previously by Dr. A. Ghiesbreght in Chiapas. *Astranthium xylopodum* is reported only from eastern Jalisco where it has been collected by both Dr. Edward Palmer and C. G. Pringle. *Astranthium orthopodum* occurs in the mountains of Chihuahua and in Durango. The oldest Mexican species and the one which is best represented in herbaria is *A. mexicanum*. It extends from Hidalgo to central Oaxaca; and a variety, *chihuahuense*, occurs in northwestern Chihuahua. *Astranthium xanthocomoides* has been reported from Hidalgo and Vera Cruz.

The scattered distribution of *Astranthium* in Mexico is probably an indication of the incomplete representation of the flora of that country in herbaria. Further collections will undoubtedly extend the distribution areas and also add to the number of species.

Two species of the genus *Keerlia* are recognized and both of these occur in south-central Texas. It is not at all unlikely that they will be found in adjacent Mexico. The distribution of the various species representing *Astranthium* and *Keerlia* is shown on the accompanying map.

#### ACKNOWLEDGMENTS

The writer wishes to express her appreciation to Dr. George T. Moore, Director of the Missouri Botanical Garden, for the use of the library and herbarium of that institution, and especially to Dr. J. M. Greenman for advice and assistance. Dr. B. L. Robinson and Dr. W. R. Maxon kindly loaned material which was necessary to the study of these genera.

#### ABBREVIATIONS

The specimens cited in this paper are deposited in the herbaria which are indicated by the following abbreviations:



G = Gray Herbarium of Harvard University.

M = Missouri Botanical Garden Herbarium.

US = United States National Herbarium.

### KEY TO THE GENERA

- A. Heads small, few-flowered.....*Keerlia*
- AA. Heads medium-sized, many-flowered.
  - a. Achenes strongly compressed, not 4-angled.
    - b. Heads subglobose; rays relatively short.....*Egletes*
  - bb. Heads not subglobose; rays relatively long.
    - c. Pappus absent or of a ring-like crown; ray-flowers uniseriate.
      - d. Receptacle smooth, conical; involucral bracts sub-uniseriate...*Bellis*
      - dd. Receptacle alveolate, convex; involucral bracts bi-tri-seriate.
        - .....*Astranthium*
    - cc. Pappus of a short unequally lacerated crown; ray-flowers in 2 or more series.....*Achaetogeron*
  - aa. Achenes not compressed, subterete, or distinctly 4-5-angled....*Aphanostephus*

### KEY TO SPECIES OF ASTRANTHIUM

- A. Stems erect or suberect from a distinctly ligneous base.
  - a. Leaves glabrous.....1. *A. mimum*
  - aa. Leaves more or less pubescent.
    - b. Stems usually unbranched above.
      - c. Leaves oblong-elliptic.....2. *A. xylopodium*
      - cc. Leaves oblanceolate to linear.....3. *A. orthopodium*
    - bb. Stems usually branched above.
      - c. Leaves dentate.....4. *A. mexicanum*
      - cc. Leaves entire.....4a. Var. *chihuahuense*
- AA. Stems erect or procumbent from an annual or slightly ligneous base.
  - a. Plants with long slender runners.....5. *A. xanthocomoides*
  - aa. Plants without long slender runners.
    - b. Achenes glabrous.....6. *A. purpurascens*
    - bb. Achenes pubescent with glochidiate-tipped hairs.
      - c. Leaves not rosulate.
        - d. Plants not conspicuously branched.....7. *A. integrifolium*
        - dd. Plants conspicuously branched.....7a. Var. *ciliatum*
      - cc. Leaves rosulate.....7b. Var. *rosulatum*

### TAXONOMY

#### ASTRANTHIUM

*Astranthium* Nutt. Trans. Am. Phil. Soc. N. S. 7: 312. 1841; Benth. & Hook. Gen. Pl. 2: 265. 1873, as to synonymy.

*Bellis* Michx. and Am. authors, Fl. Bor. Am. 2: 131. 1803, not of Linnaeus; Hook. Bot. Mag. 52: pl. 3455. 1835; DC. Prodr. 5: 304. 1836; Raf. New Fl. Am. 2: 24. 1836; Torr. &



Gray, Fl. N. Am. 2: 189. 1842; Gray in Hemsl. Biol. Cent.-Am. Bot. 2: 118. 1881; Gray, Syn. Fl. N. Am. 1<sup>2</sup>: 163. 1884, and ed. 2, 163. 1886 and 1888; Britton & Brown, Ill. Fl. 3: 350. 1898, and ed. 2, 3: 402. 1913; Britton, Manual, 943. 1901, and ed. 2, 1905; Rob. & Fern. in Gray, Manual, ed. 7, 799. 1908; Small, Fl. Southeastern U. S. 1202. 1903, and ed. 2, 1913.

Herbaceous, caulescent, glabrate, or pubescent annuals or perennials. Leaves alternate, sessile or petioled, linear-lanceolate to obovate-spathulate, entire or dentate. Involucre 2-3-seriate, imbricated, appressed, lanceolate bracts usually with lacerately ciliate, membranaceous margins. Heads few- to many-flowered. Ray-flowers pistillate, rays 2-3-dentate. Disk-flowers tubular, perfect, corolla 5-lobed. Style-branches linear-lanceolate, acute, papillose at the tip, stigmatic surfaces confined to the lowermost margins of the style-branches and extending one third of their length. Pappus entirely lacking or an inconspicuous ring-like crown. Achenes obovate, compressed, narrowed at the base, pubescent with glochidiate or emarginate hairs, rarely glabrous.

Type species: *Astranthium integrifolium* (Michx.) Nutt. Trans. Am. Phil. Soc. N. S. 7: 312. 1841, which was based on *Bellis integrifolia* Michx. Fl. Bor. Am. 2: 131. 1803, "ad ripas rivulorum et in collibus umbrosis Tennassée."

**1. *Astranthium mimum* (Blake) Larsen, n. comb.**

*Bellis mima* Blake, Contr. U. S. Nat. Herb. 22: 594. 1924.

Herbaceous perennial, 38-50 cm. high; stems several, simple, erect, monocephalous, greenish, striate, glabrous or sparsely pubescent with spreading hairs; basal leaves few, obovate-oblong, apiculate, narrowed at the base into a slender petiole, 15-20 cm. long, 2-3 cm. wide, somewhat membranous in the dried state; stem-leaves linear-lanceolate, hirsute-ciliate, lower 5-6 cm. long, 4-6 mm. wide, gradually reduced above, the uppermost 1 cm. long, 1 mm. wide; peduncles terminal, monocephalous, enlarged just below the head; involucre 2-2.5 cm. in diameter; bracts 2-seriate, equal, 7 mm. high, linear, acute, sparsely pilose, ciliate; ray-flowers about 60, white, fertile, 3-dentate, about 12 mm. long; disk-flowers yellow, fertile, pappus



none; achenes of ray and disk similar, oblong, compressed, glabrous.

Distribution: State of Durango, Mexico. Known only from type specimen.

Specimens examined:

DURANGO: from Sierra Madre, 30 miles north of Guanacevi, alt. 2440–2745 m., Aug. 18, 1898, *Nelson 4786* (US, No. 332836, TYPE).

**2. *Astranthium xylopodum* Larsen, n. name.**

*Keerlia mexicana* Gray, Proc. Am. Acad. **22**: 422. 1887, not *Bellis mexicana* Gray, Smiths. Contr. [Pl. Wright. pt. 1] **3**: 93. 1852.

Perennial from a woody base; stems several, simple, or slightly branched near the top, striate, hirsute with spreading pubescence; peduncles 10–14 cm. long, naked or bearing 1–2 small linear-lanceolate bracts near the inflorescence, hirsute-pubescent; leaves oblong-elliptic, evenly pubescent with appressed hirsute hairs, margins strongly ciliate; involucre 1–2 cm. in diameter; bracts linear-lanceolate, pubescent, margins lacerately ciliate, somewhat membranaceous; ray-flowers fertile, about 20; pappus lacking; achenes 4-nerved, glabrous.

Distribution: known only from the State of Jalisco, Mexico.

Specimens examined:

JALISCO: shaded hillsides near Guadalajara, June 27–July 14, 1893, *Pringle 4412* (M, G); Rio Blanco, July 1886, *Edward Palmer 146* (G, TYPE).

**3. *Astranthium orthopodum* (Rob. & Fern.) Larsen, n. comb.**

*Bellis orthopoda* Rob. & Fern. Proc. Am. Acad. **30**: 117. 1894.

Perennial from a short, thick rootstalk; stems several, decumbent or suberect, 10–20 cm. high, simple or somewhat branched, appressed-pubescent, monocephalous; leaves thick, entire, appressed-pubescent, basal leaves oblong-spathulate, 3–4 cm. long, 3–5 mm. broad, stem-leaves linear-lanceolate, erect, gradually reduced toward the inflorescence; peduncles 3–4.5 cm. long, appressed-pubescent; involucre 10–12 mm. in diameter; bracts 2-seriate, linear-lanceolate, acute, purple-margined, sparsely and somewhat appressed-pubescent, 4–5 mm. long; ray-flowers about 30, 1 cm. long; achenes sparsely pubescent with glochidiate or straight and slightly emarginate hairs; pappus an inconspicuous whitish ring-like crown.

Distribution: western Chihuahua, southward along mountains in the state of Durango, Mexico.



## Specimens examined:

CHIHUAHUA: Guachachic, June 25, 1892, *Hartman 523* (G, TYPE); vicinity of Madera, alt. 2250 m., May 27–June 3, 1908, *Edward Palmer 287* (M).

DURANGO: City of Durango and vicinity, Apr.–Nov. 1896, *Edward Palmer 163* (M); Otinapa, July 25–Aug. 5, 1906, *Edward Palmer 425* (M).

**4. *Astranthium mexicanum* (Gray) Larsen, n. comb.**

*Bellis mexicana* Gray, *Smiths. Contr. [Pl. Wright. pt. 1] 3: 93*. 1852; Gray in *Hemsl. Biol. Cent.-Am. Bot. 2: 118*. 1881.

Perennial from a branched ligneous base; stems 15–60 cm. high, several, branched above, striate, pubescent with spreading hairs; leaves appressed-pubescent, those of the stem sessile, entire, or saliently dentate, oblong-linear, gradually reduced toward the inflorescence, basal leaves ellipsoid-spathulate, crenate-dentate, 5–20 cm. long, .8–2.5 cm. broad; involucre .8–1.4 cm. in diameter; bracts 2–3-seriate, cinereous-pubescent, linear-lanceolate, purple-tipped; ray-flowers white, numerous, .5–1.0 cm. long; pappus an inconspicuous ring-like crown or almost obsolete; achenes compressed, pubescent.

Distribution: mountains of south-central Mexico.

## Specimens examined:

HIDALGO: Sierra de Pachuca, alt. 3076 m., Aug. 26, 1902, *Pringle 9857* (M).

MEXICO: Apr. 26, 1849, *Gregg 701* (M, TYPE); along brooks, Ixtaccihuatl, March–July 1903, *Purpus 159* (M); moist open woods and meadows about timber line, Ixtaccihuatl, Oct. 1905, *Purpus 1575* (M); “above timber line,” Popocatepetl, Oct. 1908, *Purpus 3640* (M).

FEDERAL DISTRICT: Cima, Aug. 24, 1910, *Orcutt 3768* (M); Serrania de Ajusco, alt. 3076 m., Aug. 8, 1896, *Pringle 6442* (M).

MORELOS: Toro, alt. 3015 m., Aug. 5, 1924, *Fisher* (M, No. 914805).

OAXACA: Sierra de San Felipe, alt. 3076 m., June 28, 1894, *Pringle 4719* (M); Sierra de San Felipe, alt. 3076 m., Sept. 1894, *Smith 261* (M).

**4a. Var. *chihuahuense* Larsen, n. var.<sup>22</sup>**

Plate 3.

Resembles the species in habit but differs from it in that it is much less pubescent; the leaf margins are essentially entire, ciliate; the pappus is more conspicuous than that of the species and consists of a narrow fluted crown; the achenes are glabrous, or glabrate.

<sup>22</sup> *Astranthium mexicanum* (Gray) Larsen var. *chihuahuense* Larsen, n. var., planta herbacea perennis, 6–7 dm. alta, supra ramosa; marginibus foliorum integris vel subintegris; pappo coroniforme, margine irregulariter sinuato-dentato; achaeniis glabris vel glabratiss.—MEXICO: canyons of Sierra Madre, State of Chihuahua, Oct. 4, 1888, *Pringle 2015* (M, No. 122921, TYPE).



Distribution: State of Chihuahua, Mexico, known only from the type.

Specimens examined:

CHIHUAHUA: canyons of Sierra Madre, Oct. 4, 1888, *Pringle 2015* (M, No. 122921, TYPE).

**5. *Astranthium xanthocomoides* (Less.) Larsen, n. comb.**

*Brachycome xanthocomoides* Less. Syn. 192. 1832, nomen nudum; Schlecht. in *Linnaea* 9: 265. 1835.

*Brachycome xeranthemoides* Steud. Nomencl. Bot. ed. 2, 220. 1840, in part (typographical error).

*Keerlia linearifolia* DC. Prodr. 5: 310. 1836, in part as to synonym.

*Bellis xanthocomoides* (Less.) Gray in Hemsl. Biol. Cent.-Am. Bot. 2: 118. 1881.

Annual; stems several, striate, procumbent or ascending, branching, leafy throughout, producing slender runners; leaves spathulate, apiculate, sparsely pubescent, gradually reduced toward the peduncles, 1.5–2.5 cm. long, .3–.8 cm. broad; peduncles 1–6 cm. long, densely pubescent at the base of the involucre; involucre .8–1.2 cm. in diameter; bracts 2-seriate, lanceolate, acute, pubescent along the lower portion of the main axis, membranaceous-margined; ray-flowers white, .5–.8 cm. long, about 16; pappus practically lacking; achenes compressed, pubescent, becoming more or less glabrate.

Distribution: alpine meadows and open woods of east-central Mexico.

Specimens examined:

VERA CRUZ: prope la Jaya (La Hoya), June 29, *Schiede 206* (M, TYPE).

HIDALGO: meadows of Sierra de Pachuca, alt. 2760 m., July 17–28, 1898, *Pringle 6888* (M); alpine meadows, Sierra de Pachuca, alt. 2923 m., Aug. 26, 1902, *Pringle 9858* (M); moist meadows and open woods, Pachuca, July 1905, *Purpus 1344* (M).

**6. *Astranthium purpurascens* (Rob.) Larsen, n. comb.**

*Bellis purpurascens* Rob. Proc. Am. Acad. 27: 172. 1892.

Perennial; roots of numerous fibers; stems erect, branched, 4–45 cm. high, striate, pubescent with spreading hairs; leaves apiculate, pubescent with spreading hairs, margins somewhat ciliate; lower leaves oblong-ovate, 2.5–4.0 cm. long, 1.5–6 cm. broad; upper leaves linear to linear-lanceolate, gradually reduced, 1 cm. or less in length at the base of the peduncles; peduncles 3–8 cm. long; involucre .8–1.0 cm. in diameter; involucral bracts about 14–16, lanceolate, acute, scarious-margined, only slightly



ciliate near the apex, pubescent along the main axis with a few upwardly appressed hairs; rays 10–15, whitish-purple, .5–.8 cm. long; pappus lacking; achenes glabrous, golden-brown at maturity.

This species is closely allied to *A. integrifolium* (Michx.) Nutt.; the chief difference is to be found in achenial characters. *Astranthium integrifolium* has achenes which are pubescent with glochidiate-tipped hairs whereas *A. purpurascens* (Rob.) Larsen has glabrous achenes.

Distribution: known only from the type locality and Chiapas, Mexico.

Specimens examined:

SAN LUIS POTOSI: shaded grassy slopes, barranca of Las Canoas, Aug. 18, 1891, Pringle 3819 (M, COTYPE).

CHIAPAS: without definite locality, coll. of 1864–70, Ghiesbreght 548 (M).

**7. *Astranthium integrifolium*** (Michx.) Nutt. Trans. Am. Phil. Soc. N. S. 7: 312. 1841.

*Bellis integrifolia* Michx. Fl. Bor. Am. 2: 131. 1803; Hook. Bot. Mag. 52: pl. 3455. 1835, in part, exclusive of *Brachycome xanthocomoides* Less.; DC. Prodr. 5: 304. 1836; Raf. New Fl. Am. 2: 24. 1836; Torr. & Gray, Fl. N. Am. 2: 189. 1842; Gray, Syn. Fl. N. Am. 1<sup>2</sup>: 163. 1884, and ed. 2, 1886 and 1888; Britton & Brown, Ill. Fl. 3: 350. 1898, and ed. 2, 3: 402. 1913; Britton, Manual, 943. 1901, and ed. 2, 1905; Rob. & Fern. in Gray, Manual, ed. 7, 799. 1908; Small, Fl. Southeastern U. S. 1202. 1903, and ed. 2, 1913.

*Bellis nutans* Raf. New Fl. Am. 2: 23. 1836.

*Bellis parviflora* Raf. *Ibid.*

*Eclipta integrifolia* Spreng. Syst. Veg. 3: 602. 1826.

Annual, openly branched from near the base, 8–45 cm. high, sparsely pubescent with spreading or subappressed hairs, frequently conspicuously pubescent near the base, leafy throughout; lower leaves oblong-spathulate, 2.5–4.0 cm. long, .8–1.4 cm. broad; stem-leaves oblong-ovate, sparsely pubescent, margins ciliate, 3.5 cm. long, 1.5 cm. broad, gradually reduced toward the base of the peduncle; peduncles 4–9 cm. long, densely pubescent at the base of the involucre; involucre 2-seriate, about .6–1.2 cm. in diameter, bracts lanceolate, acuminate, acute, membranous margins only slightly lacerate, sparsely pubescent along the main



axis with a few spreading hairs; ray-flowers fertile, 16–22, purplish-blue; achenes compressed, pubescent with glochidiate-tipped hairs.

Distribution: sandy soil, south-central Kentucky to northwestern Georgia, westward to southeastern Kansas and eastern Oklahoma.

Specimens examined:

GEORGIA: dry ground, Ringold Road, Chickamauga, May 27, 1911, *Churchill* (M, No. 839094).

MISSISSIPPI: Tchula, Holmes Co., Apr. 18, 1927, *Woodson & Anderson* 1555 (M).

KENTUCKY: Bowling Green, May 6, 1892, *Price* (M, No. 122882).

TENNESSEE: West Nashville, May 26–27, 1909, *Eggleston* 4422 (M); moist field, Joelton, Davidson Co., July 16, 1922, *Svenson* 118 (G); copses around Nashville, May–June, *Gattinger* 1297 (M); rocky open hillsides, near Erin, Houston Co., May 24, 1920, *E. J. Palmer* 17623 (M, G).

MISSOURI: gravelly barrens, Noel, May 10, 1915, *Bush* 7534 (M, G); gravelly barrens, Noel, May 10, 1915, *Bush* 7534 A (M); rocky open ground, near Jane, MacDonald Co., May 23, 1931, *E. J. Palmer* 39297 (M); rocky slopes, bald knobs, along creek, near Oasis, Taney Co., June 3, 1931, *E. J. Palmer* 39483 (M).

ARKANSAS: river bottoms near Fayetteville, June 1835, *Engelmann* 129 [607] (M); alluvial soil, waste places, cultivated fields, Fayetteville, May, *Harvey* 45 (M); Fayetteville, 1880, *Harvey* (M, No. 122880); Hot Springs, May, 1879, *Soulard* (M, No. 122885); sandy soil, Cotter, Marion Co., June 15, 1914, *E. J. Palmer* 5992 (M).

KANSAS: rocky soil, Chautauqua Co., May 7, 1897, *Hitchcock* 1055 (M).

OKLAHOMA: in woods and meadows, common near Tishomingo, Johnston Co., Apr. 27, 1916, *Houghton* 3549 (G); clay washes, near Ardmore, Carter Co., Apr. 17, 1913, *Stevens* 77 (M); Arbuckle Mts., Crusher, May 12, 1916, *Emig* 606 (M); Catoosa, May 8, 1895, *Bush* 897 (M); Ind. Terr., 1877, *Butler* (M, No. 122886); upland prairies, sandy soil, near Howe, Le Flore Co., May 25, 1931, *E. J. Palmer* 39343 (M).

**7a. Var. *ciliatum* (Raf.) Larsen, n. comb.** Pl. 4, fig. 1.

*Bellis ciliata* Raf. New. Fl. Am. 2: 24. 1836.

*Bellis integrifolia* Gray, Smiths. Contr. [Pl. Wright. pt. 2] 5: 78. 1853, in part.

Stems several, diffusely branched from near the base, 1–3 dm. high, terminated by long slender peduncles; leaves oblong-spathulate to linear-oblong, reduced to small bract-like leaves at the base of the peduncles, .8–3.0 cm. long, .2–.8 cm. broad, sparsely pubescent with subappressed hairs, margins ciliate; peduncles 4–6 cm. long; involucre .5–.8 cm. in diameter; involucre bracts lance-elliptic, acute, the narrow membranaceous margins lacerately ciliate; ray-flowers about 9–15; achenes pubescent with glochidiate-tipped hairs.

Distribution: from southeastern Oklahoma and southwestern Arkansas to south-central Texas, west to the Pecos.



## Specimens examined:

ARKANSAS: moist open ground, Fayetteville, Washington Co., July 6, 1915, *E. J. Palmer 8176* (M); Coal Bank, May 14, 1895, *Bush 895* (M); Redfork, May 14, 1895, *Bush 896* (M).

OKLAHOMA: open woods near Idabel, McCurtain Co., May 18, 1916, *Houghton 3645* (G).

TEXAS: Apr.-May, 1844, *Lindheimer 251* (M); "Pine's Island," May 5, 1903, *Reverchon* (M, No. 122889); *Reverchon 440* in part (M, No. 122890); clay barrens, Bryan, Brazos Co., May 27, 1915, *E. J. Palmer 7785* (M); Pecos and Limpio, June 1851-2, *Wright 1176* in part (M, No. 123093); dry banks, Hempstead, Apr. 24, 1872, *Hall 306* (M).

**7b. Var. *rosulatum* Larsen, n. var.<sup>23</sup>**

Pl. 4, fig. 2.

*Bellis integrifolia* Gray, Smiths. Contr. [Pl. Wright. pt. 2] 5: 78. 1853, in part.

Stems several, sparsely branched near the base, pubescent with spreading hairs, .5-1.5 dm. high; leaves sparsely pubescent with subvillose hairs; basal leaves numerous, forming a rosette, oblong-spathulate, 2-7 cm. long, .5-1 cm. broad; stem-leaves oblong-spathulate to linear-lanceolate, gradually reduced to the base of the peduncle; peduncle 1.5-5 cm. long; involucre about .7 cm. in diameter; bracts lance-elliptic, acute, the narrow membranaceous margins somewhat lacerately ciliate near the apex; ray-flowers about 16; achenes densely pubescent with glochidiate-tipped hairs.

Distribution: central Oklahoma and eastern Texas west to Presidio County.

## Specimens examined:

OKLAHOMA: open woods near Mannsville, Johnston Co., May 16, 1916, *Griffith 3455* (M, G); Limestone Gap, Apr. 16, 1877, *Butler 63* (M); Sapulpa, Apr. 28, 1895, *Bush 927* (M); "Arkansas," May 20, 1895, *Bush 929* (M).

TEXAS: sandy prairies, Columbia, Brazoria Co., March 25, 1914, *E. J. Palmer 5028* (M); Victoria, Victoria Co., March 5, 1916, *E. J. Palmer 9070* (M); sandy open ground, Larissa, Cherokee Co., Apr. 7, 1916, *E. J. Palmer 9388* (M); sandy prairies, Matagorda, Matagorda Co., March 5, 1914, *E. J. Palmer 4855* (M, No. 753171, TYPE); on plains, Handley, Apr. 15, 1913, *Ruth 74* (M, G); along railroads near Houston, Apr. 23, 1899, *Eggert* (M, Nos. 122893 & 122895); Terrell, Apr. 6, 1903, *Reverchon 4006* (M); prairies near Victoria, Apr. 7 & 10, 1900, *Eggert* (M, No. 122899); Pecos and Limpio, June 1851-2, *Wright 1176* in part (M, No. 123091); near San Felipe,

<sup>23</sup> *Astranthium integrifolium* (Michx.) Nutt. var. *rosulatum* Larsen, n. var., caule simplice vel basi ramoso, 0.5-1.5 dm. alto, subviloso; foliis basalibus rosulatis, oblongo-spathulatis, 2-7 cm. longis, usque ad 1 cm. latis, integris, ad apicem rotundatis vel obtusis, sparse pubescentibus; foliis caulinis oblongo-spathulatis vel linearilanceolatis, integris, superne sensim minoribus; pedunculis 1-6 cm. longis.—TEXAS: on sandy prairies, Matagorda, Matagorda County, March 5, 1914, *E. J. Palmer 4855* (M, 753171, TYPE).



Apr. 1839, *Lindheimer* (M, No. 122904); along river, Columbia, Apr. 19, 1899, *Bush* 195 (M); on prairie, Chenango Junction, Apr. 18, 1900, *Bush* 60 (M); *Reverchon* 440 in part (M, No. 122898); open ground, along railway grade near Marfa, Presidio Co., June 18, 1926, *E. J. Palmer* 31036 (M).

#### KEERLIA

**Keerlia** Gray, Bost. Jour. Nat. Hist. [Pl. Lindh. pt. 2] 6: 221, 222. 1850, in part as to *K. bellidifolia* and *K. effusa*, not DC.; Smiths. Contr. [Pl. Wright. pt. 1] 3: 92. 1852, not DC.; Syn. Fl. N. Am. 1<sup>2</sup>: 164. 1884, and ed. 2, 164. 1886 and 1888.

*Bourdonia* Greene, *Erythea* 1: 207. 1893.

Herbaceous, caulescent, pubescent annuals or perennials. Leaves alternate, sessile or petioled, oblong to obovate-spathulate, entire. Involucre of imbricated lanceolate bracts, with membranaceous margins. Heads few-flowered. Ray-flowers in a single series, pistillate, fertile. Disk-flowers tubular, five-lobed, frequently sterile. Branches of the style lanceolate, acutish, hairy toward the tip. Pappus a thickened ring-like or slightly lacerated crown. Achenes compressed, glabrate or hirsute-pubescent.

Type species: *K. bellidifolia* Gray & Engelm. Proc. Am. Acad. 1: 47. 1848, which was based on No. 415 of Lindheimer, collected above Guadeloupe, Texas, 1845–1846.

#### KEY TO THE SPECIES

Stems branched from the base.....8. *K. bellidifolia*.  
Stems simple to the inflorescence.....9. *K. effusa*

**8. *Keerlia bellidifolia*** Gray and Engelm. Proc. Am. Acad. 1: 47. 1848; Gray, Bost. Jour. Nat. Hist. [Pl. Lindh. pt. 2] 6: 220. 1850; Smiths. Contr. [Pl. Wright. pt. 1] 3: 92. 1852; Syn. Fl. N. Am. 1<sup>2</sup>: 164. 1884, and ed. 2, 164. 1886 and 1888.

*Bourdonia bellidifolia* (Gray & Engelm.) Greene, *Erythea* 1: 207. 1893.

Annual; the caudex giving rise to much-branched stems 9–30 cm. high, leafy throughout, striate, pubescent with multicellular spreading hairs; leaves thin, sparsely pubescent, apiculate, lower leaves obovate-spathulate, uppermost somewhat linear, gradually reduced toward the inflorescence, 1–4 cm. long, .4–1.0 cm. broad, narrowed below to a subpetiolate base; heads small; involucre



.3-.5 cm. in diameter, bracts 2-3-seriate, glabrous, linear-lanceolate, acute, with membranaceous margins; ray-flowers 4-15, blue, fertile; disk-flowers 15-20, frequently sterile, style branches shorter than those of the ray-flowers; pappus a thickened ring-like crown; achenes nerved, compressed, glabrate.

Distribution: southern Texas; doubtless also in adjacent Mexico.

Specimens examined:

TEXAS: along Nueces Bay, Nueces Co., alt. 6 m., March 12, 1894, *Heller 1436* (M); Rock Springs, Apr. 17, 1930, *Marcus E. Jones 26575* (M); above Guadalupe, 1845-46, *Lindheimer 415* (M, co-TYPE); near New Braunfels, May 1848, *Lindheimer 628* (M); Comanche Spring, New Braunfels, Apr. 1850, *Lindheimer 932* (M); rocky calcareous ground, Del Rio, Valverde Co., March 26, 1917, *E. J. Palmer 11384* (M); dry limestone hills, Concan, Uvalde Co., Apr. 13, 1917, *E. J. Palmer 11550* (M); vicinity of San Antonio, Apr. 1919, *von Schrenk* (M, No. 88063); near Austin, March 17, 1908, *York 410* (M).

**9. *Keerlia effusa*** Gray, Bost. Jour. Nat. Hist. [Pl. Lindh. pt. 2] **6**: 222. 1850; Smiths. Contr. [Pl. Wright. pt. 1] **3**: 93. 1852; Syn. Fl. N. Am. **1**<sup>2</sup>: 165. 1884, and ed. 2, 165. 1886 and 1888.

*Bourdonia effusa* (Gray) Greene, *Erythea* **1**: 207. 1893.

Perennial, 15-60 cm. high; stem simple below, diffusely branched above into an open glabrous panicle; stem and leaves hispid-pubescent; leaves thin, lowermost leaves obovate-spathulate, 3-9 cm. long, .5-1.3 cm. broad, narrowed at the base into a petiole, those of the stem oblong with a broad, sessile, somewhat amplexicaul base, gradually reduced toward the inflorescence; heads numerous, small; involucre turbinate, 2-3 cm. in diameter; involucre bracts glabrous, 3-4-seriate, linear-lanceolate, acute, membranaceous-margined; ray-flowers 4-7, white, fertile; disk-flowers 6-9, sterile; pappus consisting of a thickened irregularly lacerate crown; achenes compressed, hispid-pubescent.

Distribution: south-central Texas.

Specimens examined:

TEXAS: *Berlandier 499* (M); White Oak Creek, Gillespie Co., *Jermy 815* (M); shady banks of the Upper Guadalupe, 50 miles above New Braunfels, 1847-48, *Lindheimer 629* (M, co-TYPE); dry hillside thickets, Leakey, Edwards Co., June 10, 1916, *E. J. Palmer 10165* (M); dry hillside thickets, Spanish Pass, Kendall Co., Sept. 28, 1916, *E. J. Palmer 10839* (M); San Geronimo Creek, June 1884, *Reverchon 1534* (M); Comanche Spring, New Braunfels, 1849, *Lindheimer 933* (M).



## LIST OF EXSICCATAE

The distribution numbers are printed in *italics*. The number in parenthesis is the species number used in this revision.

- Berlandier, J. L. *499* (9).  
 Bush, B. F. *897, 7534, 7534A* (7); *895, 896* (7a); *60, 195, 927, 929* (7b).  
 Butler, G. D.—(7); *63* (7b).  
 Churchill, J. R. — (7).  
 Eggert, H. — (7b).  
 Eggleston, W. W. *4422* (7).  
 Emig, W. H. *606* (7).  
 Engelmann, G. *129 [607]* (7).  
 Fisher, G. L. — (4).  
 Gattinger, A. *1297* (7).  
 Ghiesbreght, A. *548* (6).  
 Gregg, J. *701* (4).  
 Griffith, F. *3455* (7b).  
 Hall, Elihu. *306* (7a).  
 Hartman, C. V. *523* (3).  
 Harvey, F. L. —, *45* (7).  
 Heller, A. A. *1436* (8).  
 Hitchcock, A. S. *1055* (7).  
 Houghton, H. W. *3549* (7); *3645* (7a).  
 Jermy, Gustav. *815* (9).  
 Jones, Marcus E. *26575* (8).  
 Lindheimer, F. *251* (7a); —, (7b); *415, 628, 932* (8); *629, 933* (9).  
 Nelson, E. W. *4786* (1).  
 Orcutt, C. R. *3768* (4).  
 Palmer, E. J. *5992, 17623, 39297, 39343, 39483* (7); *7785, 8176* (7a); *4855, 5028, 9070, 9388, 31036* (7b); *11384, 11550* (8); *10165, 10839* (9).  
 Palmer, Edward, *146* (2); *163, 287, 425* (3).  
 Price, Sadie F. — (7).  
 Pringle, C. G. *4412* (2); *4719, 6442, 9857* (4); *2015* (4a); *6888, 9858* (5); *3819* (6).  
 Purpus, C. A. *159, 1575, 3640* (4); *1344* (5).  
 Reverchon, J. —, *440* in part (7a); — (7b); *4006, 440* in part (7b); *1534* (9).  
 Ruth, Albert. *74* (7b).  
 Schiede, G. *206* (5).  
 Smith, Charles L. *261* (4).  
 Soulard, Mary. — (7).  
 Stevens, G. W. *77* (7).  
 Svenson, H. K. *118* (7).  
 von Schrenk, H. (8).  
 Woodson, R. E. Jr., and Anderson, E. S. *1555* (7).  
 Wright, Charles. *1176* in part (7a); *1176* in part (7b).  
 York, H. H. *410* (8).



## PLATE 2

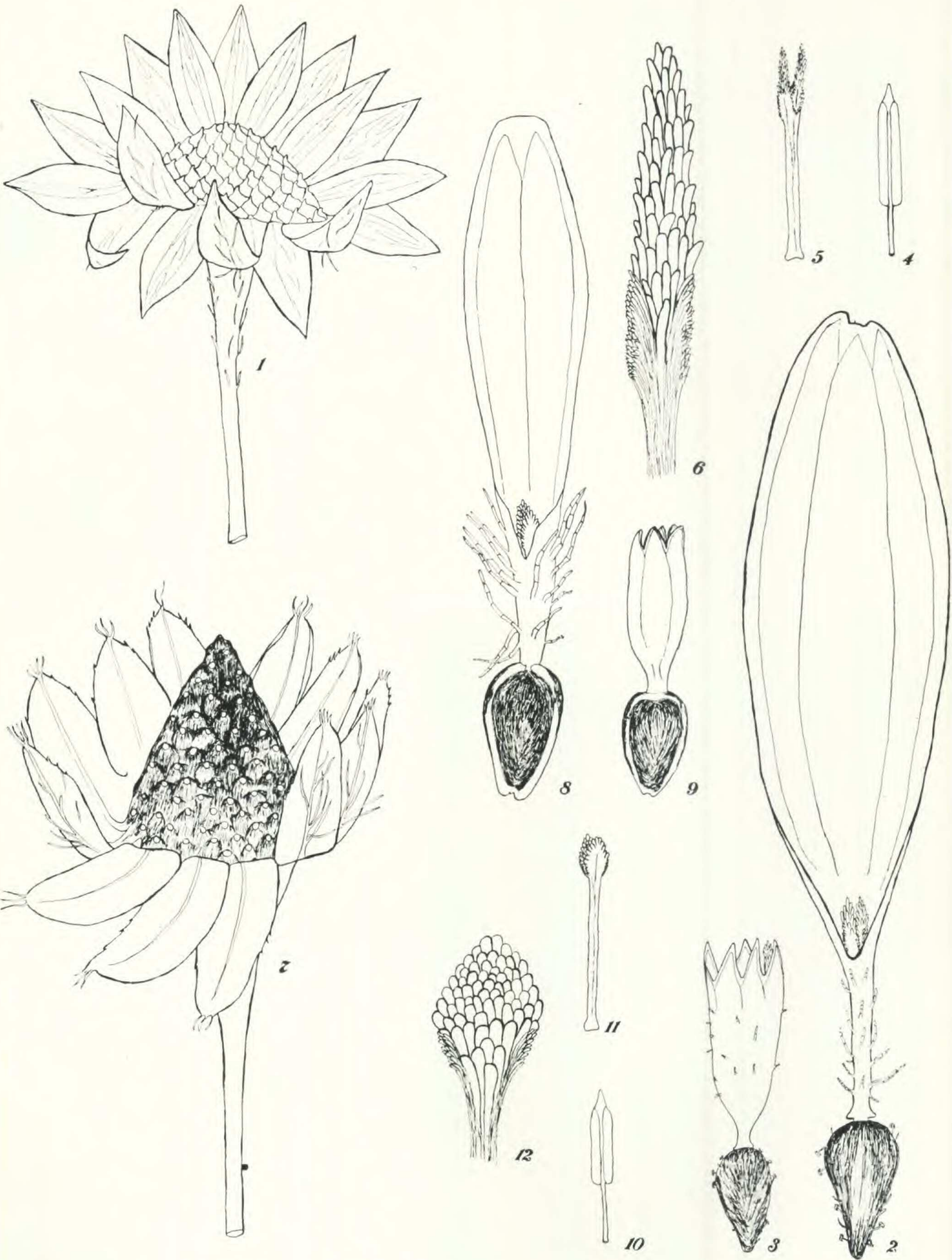
*Astranthium integrifolium* (Michx.) Nutt. from *Eggleston 4422* in the Missouri Botanical Garden Herbarium.

- Fig. 1. Involucre and receptacle,  $\times 5$ .
- Fig. 2. Ray-flower,  $\times 10$ .
- Fig. 3. Disk-flower,  $\times 10$ .
- Fig. 4. Stamen,  $\times 10$ .
- Fig. 5. Style-branches of the disk-flower,  $\times 10$ .
- Fig. 6. Style-branch greatly enlarged.

*Bellis perennis* L. from *Pring*, in the Missouri Botanical Garden Herbarium No. 918135.

- Fig. 7. Involucre and receptacle,  $\times 5$ .
- Fig. 8. Ray-flower,  $\times 10$ .
- Fig. 9. Disk-flower,  $\times 10$ .
- Fig. 10. Stamen,  $\times 10$ .
- Fig. 11. Style-branches of the disk-flower,  $\times 10$ .
- Fig. 12. Style-branch greatly enlarged.





LARSEN—ASTRANTHIUM AND RELATED GENERA



## PLATE 3

*Astranthium mexicanum* (Gray) Larsen var. *chihuahuense* Larsen. From the type specimen, *Pringle 2015*, in the Missouri Botanical Garden Herbarium.





LARSEN—ASTRANTHIUM AND RELATED GENERA



## PLATE 4

Fig. 1. *Astranthium integrifolium* (Michx.) Nutt. var. *ciliatum* (Raf.) Larsen. From *Lindheimer 251*, in the Missouri Botanical Garden Herbarium.

Fig. 2. *Astranthium integrifolium* (Michx.) Nutt. var. *rosulatum* Larsen. From the type specimen, *Palmer 4855*, in the Missouri Botanical Garden Herbarium.